

SUTHERLAND

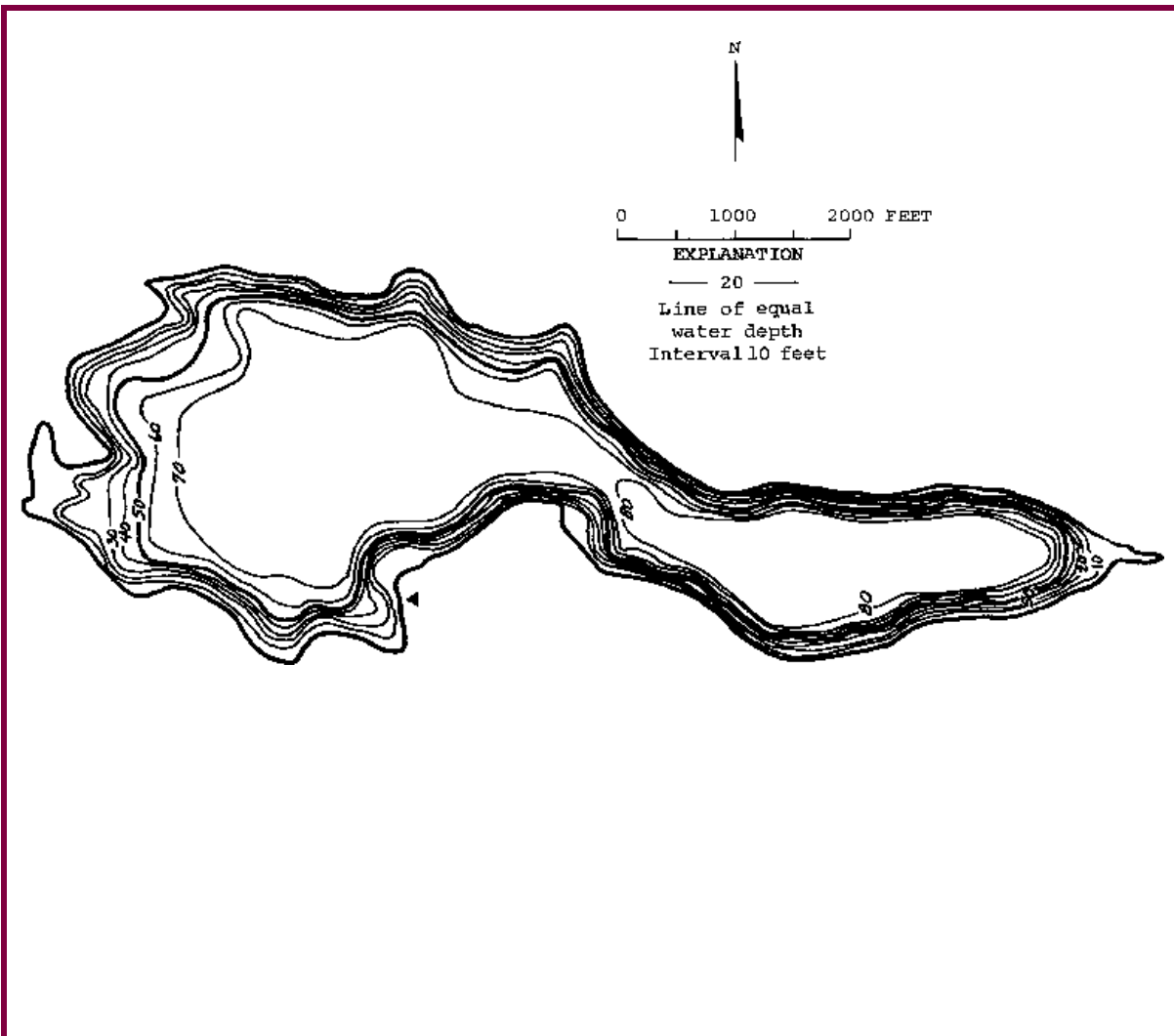
CLALLAM County

Lake ID: SUTCL1

Ecoregion: 1

Lake Sutherland is located just south of and adjacent to highway 101, approximately 3 miles east of Crescent Lake and 10 miles west of Port Angeles. Its outfall empties into Indian Creek which enters the Elwha River.

| <i>Area (acres)</i> | <i>Maximum Depth (ft)</i> | <i>Mean Depth (ft)</i> | <i>Drainage (sq mi)</i> | |
|-----------------------|---------------------------|------------------------------|-------------------------|------------------|
| 369 | 86 | 57 | 8 | |
| <i>Volume (ac-ft)</i> | <i>Shoreline (miles)</i> | <i>Altitude (ft abv msl)</i> | <i>Latitude</i> | <i>Longitude</i> |
| 20800 | 4.92 | 501 | 48 04 31. | 123 41 09. |



Station Information

SUTCL1

| | | | |
|-------------------|--------------|---|------------------------|
| Primary Station | Station # 1 | latitude: 48 04 32.8 | longitude: 123 42 03.5 |
| | Description: | Deep part of lake approximately midway on a line extending from boat launch to east end of lake | |
| Secondary Station | Station # 2 | latitude: 48 04 37.7 | longitude: 123 42 29.2 |
| | Description: | In approximate middle of western portion of lake, about 1500 feet east of westernmost point of west shore | |

Trophic State Assessment for 1998

SUTHERLAND

Analyst: KIRK SMITH

| | | |
|-----------------------------|----|---|
| TSI_Secchi: | 27 | N |
| TSI_Phos: | 26 | |
| TSI_Chlor: | 26 | |
| Narrative TSI: ^a | O | |

Lake Sutherland is a very clear lake nestled in a valley just east of Crescent Lake. The lake is heavily used by boaters and jet skiers. Most of the homes around the lake are used seasonally only, but there are two recently constructed housing developments along the north shore. The water was particularly clear with Secchi depths so deep in June we could not measure the exact depth of the disk. Clarity, phosphorus, and chlorophyll concentrations were all near ultra-oligotrophic; however, the hypolimnion was anoxic during most of the summer and there was internal phosphorus loading to the hypolimnion. These are ominous signs; anthropogenic nutrient sources should be controlled before there is a response in surface water quality, not after. We do not know the status of the fishery, but zooplankton were fairly large, which generally indicates a good predator-prey ratio. Types of watercraft use appear to be the biggest detractor for survey respondents. There were also several complaints of the smell of gasoline on the water (which we noted also) and swimmers getting coated with a thin oily film after swimming in the lake. This most likely originated from the outboard motors and jet skis on the lake. To survey respondents, no odors in the water, good swimming, and natural scenery were the most desirable characteristics. The watershed survey showed a lack of a buffer zone at the inflow near the boat launch. There was recent clear-cutting in the watershed but no erosion observed. The habitat survey revealed a shoreline lined with cottages and homes. There were many docks on the shoreline as well. The substrate was mostly silt with considerable woody debris.

We recommend that local officials evaluate the use of the lake by various watercraft in order to determine whether or not restrictions are needed in order to protect beneficial uses. Local government should also consider applying for funding to further study the lake and watershed to identify and manage nutrient sources. For now, we recommend a nutrient criterion for total phosphorus of 7.7 ug/L (the average of our measured concentrations, 4.7 ug/L, plus an adjustment for inter-annual variability, 3.0 ug/L).

^a E=eutrophic, ME=mesoeutrophic, M=mesotrophic, OM=oligomesotrophic, O=oligotrophic

Chemistry Data

SUTHERLAND

| Date | Time | Strata | Tot P (ug/L) | Tot N (mg/L) | TN:TP | Chloro- phyll (ug/L) | Fecal Col. Bacteria (#/100mL) | Hardness (mg/L) | Calcium (ug/L) | Turbidity (NTU) |
|------------------|------|--------|-----------------|-----------------|-------|----------------------------|-------------------------------------|--------------------|-------------------|--------------------|
| Station 0 | | | | | | | | | | |
| 8/13/1998 | | L | | | | | 1 U | | | |
| | | L | | | | | 2 | | | |
| 9/16/1998 | | L | | | | | 1 U | | | |
| | | L | | | | | 1 | | | |
| Station 1 | | | | | | | | | | |
| 6/8/1998 | | E | 5.1 | .062 | 12 | .5 U | | 65.9 | 19600 | .5 U |
| | | H | 16 | .137 | 9 | | | | | |
| 7/30/1998 | | E | 3 U | .063 | 21 | .64 | | | | |
| | | H | 70.2 | .165 | 2 | | | | | |
| 8/13/1998 | | E | 4.4 | .049 | 11 | .5 U | | | | .5 U |
| | | H | 66.9 | .163 | 2 | | | | | |
| 9/16/1998 | | E | 6.2 | .052 | 8 | 1.1 | | | | .8 |
| | | H | 5.3 | .157 | 30 | | | | | |
| Station 2 | | | | | | | | | | |
| 7/30/1998 | | E | 4 | | | | | | | |
| 8/13/1998 | | E | 4.1 | .064 | 16 | | | | | |
| 9/16/1998 | | E | | .042 | | .83 | | | | |

Strata: L=lake surface, E=epilimnion, H=hypolimnion; Qualifier: J=Estimate, U=Less than

Watershed Survey

SUTHERLAND

Survey Date: 9/16/1998

Land Uses (1 = Primary, 2 = Secondary, etc.)

☐ Agriculture(commercial, not hobby)

☐ 1 Residential

☐ Commercial, Industrial

☐ 2 Park, forest or natural

☐ 3 Major transportation

Impervious surfaces (Roads and parking area): No Curbs

Observations (check mark denotes presence)

BMP's ☐

Shoreline very much developed around the lake. Lots of recent clear-cutting in watershed but no erosion observed.

Odors ☐

Cattle ☐ Ducks ☐ Geese ☐

Fertilizers and weed killers appear to be used in residential or agriculture area ☐

Buffer zones around streams and wetlands ☐

Buffer zone absent around inflow near boat launch. Most of shoreline around the lake is developed but watershed is largely undeveloped forest land with some clear-cutting in the recent past.

Irrigation ☐

Survey Id: 90

Habitat Survey Summary Report

SUTHERLAND

Data are averages of 10 Stations Surveyed

Date of Visit: 9/16/1998

Vegetation Type (Avg. only of sites w/ vegetation present; 1=coniferous, 3=deciduous)

| | | | |
|-------------------|-----|-------------------------------------|----|
| Canopy Layer Avg: | 1.9 | Number of stations with canopy: | 10 |
| Understory Avg: | 1.9 | Number of stations with understory: | 10 |

Percent Areal Coverage (0 = absent, 1 = <10%, 2 = 10-40%, 3 = 40-75%, 4 = >75%)

| | | |
|---|--|-----|
| Canopy Layer: | trees > 0.3 m DBH | 1.1 |
| | trees < 0.3 m DBH | 2.1 |
| Understory: | woody shrubs saplings | 2.6 |
| | tall herbs, forbs grasses | 0.5 |
| Ground Cover: | woody shrubs seedlings | 2.3 |
| | herbs, forbs, grasses | 1.1 |
| | standing water or inundated veg | 0.8 |
| | barren or buildings | 0.8 |
| Substrate Type (within shoreline plot): | bedrock | 0.0 |
| | boulders | 0.5 |
| | cobble/gravel | 1.0 |
| | loose sand | 0.4 |
| | other fine soil/sediment | 0.1 |
| | vegetated | 2.4 |
| | other | 1.2 |
| Bank Features: | angle (0:<30; 1: 30-75; 2:nr vertical) | 1.2 |
| | vertical dist (M from wtrln to high wt): | 0.2 |
| | horiz. dist. (M from wtrln to high wt): | 0.6 |

Human Influence (0 = absent, 1 = adjacent to or behind plot, 2 = present within plot)

| | |
|-----------|-----|
| buildings | 1.4 |
|-----------|-----|

| | |
|---------------------------------|-----|
| commercial | 0.0 |
| park facilities | 0.2 |
| docks/boats | 1.8 |
| walls, dikes, or revetments | 0.8 |
| litter, trash dump, or landfill | 0.4 |
| roads or railroad | 0.4 |
| row crops | 0.0 |
| pasture or hayfield | 0.0 |
| orchard | 0.0 |
| lawn | 0.7 |
| other | 0.0 |

Physical Habitat Characteristics

| | |
|------------------------------------|-----|
| station depth (at 10 m from shore) | 6.8 |
|------------------------------------|-----|

Bottom Substrate (0 = absent, 1 = <10%, 2 = 10-40%, 3 = 40-75%, 4 = >75%)

| | |
|--------------|-----|
| bedrock | 0.0 |
| boulders | 0.4 |
| cobble | 0.9 |
| gravel | 0.9 |
| sand | 0.2 |
| silt | 2.7 |
| woody debris | 2.1 |

Macrophyte Areal Coverage (0 = absent, 1 = <10%, 2 = 10-40%, 3 = 40-75%, 4 = >75%)

| | |
|------------------|-----|
| submergent | 1.3 |
| emergent | 0.0 |
| floating | 0.1 |
| total weed cover | 0.1 |

| | |
|---|-----|
| Do macrophytes extend lakeward (-1 = yes, 0 = no) | 0.0 |
|---|-----|

Fish Cover (0 = absent, 1 = Present but sparse, 2 = moderate to heavy)

| | |
|-------------------------------|-----|
| aquatic weeds | 0.8 |
| snags | 0.2 |
| brush or woody debris | 1.2 |
| inundated live trees | 0.0 |
| overhanging vegetation | 0.7 |
| rock ledges or sharp dropoffs | 0.3 |
| boulders | 0.1 |
| human structures | 1.0 |

Questionnaire

SUTHERLAND

Results compiled from 13 Surveys. Average time (years) respondents spent on lake: 20.77

Did the following add (+1), detract (-1), or have no effect (0) on your enjoyment of the lake today?

| | | | | | |
|----------------------|------|-----------------------|------|-------------------|-----|
| Types of WaterCraft: | -0.4 | View: | 0.8 | Distance to Lake: | 0.0 |
| Public Access: | 0.0 | Swim Beach: | 0.3 | Canada Geese: | 0.0 |
| Water Clarity: | 0.0 | Water Qual. for Swim: | -0.1 | | |
| Fishing Quality: | 0.3 | Aquatic Plants: | -0.2 | | |

On a scale of 1 (poor) to 5 (excellent), how would you rate water quality today? 3.2

Which would you rather have, 1 or 2?

- 1) Better fishing and more natural habitat, or 2) clearer water? 1.8
- 1) Better fishing and more natural habitat, or 2) fewer aquatic plants? 1.3
- 1) Clearer water, or 2) fewer aquatic plants? 1.0

How important is each of the following characteristics to you (1 = very undesirable, 5= very desirable):

| | | | | | |
|------------------------|-----|-----------------------|-----|------------------|-----|
| Restricted Watercraft: | 4.3 | Good Warmwtr Fishing: | 2.4 | Natural Scenery: | 4.7 |
| Plant Growth: | 2.4 | Good Swimming: | 4.7 | Public Beach: | 3.2 |
| Natural Shoreline: | 3.2 | Less Algae: | 4.1 | Canada Geese: | 3.1 |
| No Odors: | 4.7 | Public Access: | 2.9 | | |
| Good Coldwtr Fishing: | 4.2 | Clear Water: | 4.8 | | |

Tabulated Results

| Survey ID | Date | -----Residency----- | Rent or Own | Primary Activity* | -----Water Clarity----- Purchase Factor? | Has it Changed? | When? |
|---|-----------|---------------------|-------------|-------------------|---|-------------------------------------|-------------|
| 34 | 9/12/1998 | Resident | Permanent | Rent | 10 | <input checked="" type="checkbox"/> | No |
| 36 | 9/9/1998 | Resident | Seasonal | Rent | 6 | <input checked="" type="checkbox"/> | Worse 1988 |
| Water that does not smell like gas and oil and does not leave a film on glasses. | | | | | | | |
| 37 | 9/3/1998 | Resident | Permanent | Rent | 6 | <input checked="" type="checkbox"/> | Worse 1995 |
| Jet skis are very undesirable | | | | | | | |
| 38 | 9/8/1998 | Resident | Permanent | Rent | 6 | <input checked="" type="checkbox"/> | Worse 95-96 |
| Jet skis are very undesirable | | | | | | | |
| 39 | 9/8/1998 | Resident | Seasonal | Rent | 3 | <input type="checkbox"/> | Unknown |
| 40 | 9/4/1998 | Resident | Permanent | Rent | 2 | <input checked="" type="checkbox"/> | No |
| Very desirable to have quiet boats and quiet people | | | | | | | |
| 41 | 9/5/1998 | Resident | Permanent | Rent | 6 | <input checked="" type="checkbox"/> | Worse 1993 |
| We must limit jet skis. They are a danger to swimmers and small boaters. I notice burning eyes after swimming. They are also operated in a very aggressive manner, bothering ducks and noise. | | | | | | | |
| 44 | 9/8/1998 | Resident | Permanent | Rent | several of the above | <input type="checkbox"/> | Better 1998 |
| Do not want personal watercraft banned but do want usage regulated as to not create an unsafe condition in regards to all other uses. | | | | | | | |
| 45 | 9/8/1998 | Resident | Seasonal | Rent | working on property | <input checked="" type="checkbox"/> | Unknown |
| too many jetskis | | | | | | | |
| 46 | 8/26/1998 | Resident | Permanent | Rent | 10 | <input checked="" type="checkbox"/> | Worse 1988 |
| 48 | 9/9/1998 | Resident | Seasonal | Rent | 6 | <input checked="" type="checkbox"/> | Worse 1988 |
| The lake smells of gas and oil from all the jet ski type personal watercraft on the lake. The noise is also not conducive to the natural scenery. | | | | | | | |
| 49 | 9/3/1998 | Resident | Permanent | Rent | 6 | <input type="checkbox"/> | No |
| 52 | 9/16/1998 | Visitor | | | 4 | <input type="checkbox"/> | Unknown |

* 1=canoe/kayak, 2=fish, 3=pers. wtrcraft, 4=mtrboat, 5=sail, 6=swim/wade, 7=watch wldlf, 8=ski, 9=windsurf, 10=relaxing

Date 6/8/1998

Station: 1

Sample ID 24

Number of organisms measured: 38

| Group | Percent |
|-------|---------|
|-------|---------|

| | |
|------------|-------|
| Cladoceran | 55.3% |
|------------|-------|

| | |
|---------|-------|
| Copepod | 44.7% |
|---------|-------|

| | |
|-------|--|
| Other | |
|-------|--|

| Group | Percent |
|-------|---------|
|-------|---------|

| | |
|-------------|-------|
| Small < 1mm | 65.8% |
|-------------|-------|

| | |
|--------------|-------|
| Large >= 1mm | 34.2% |
|--------------|-------|

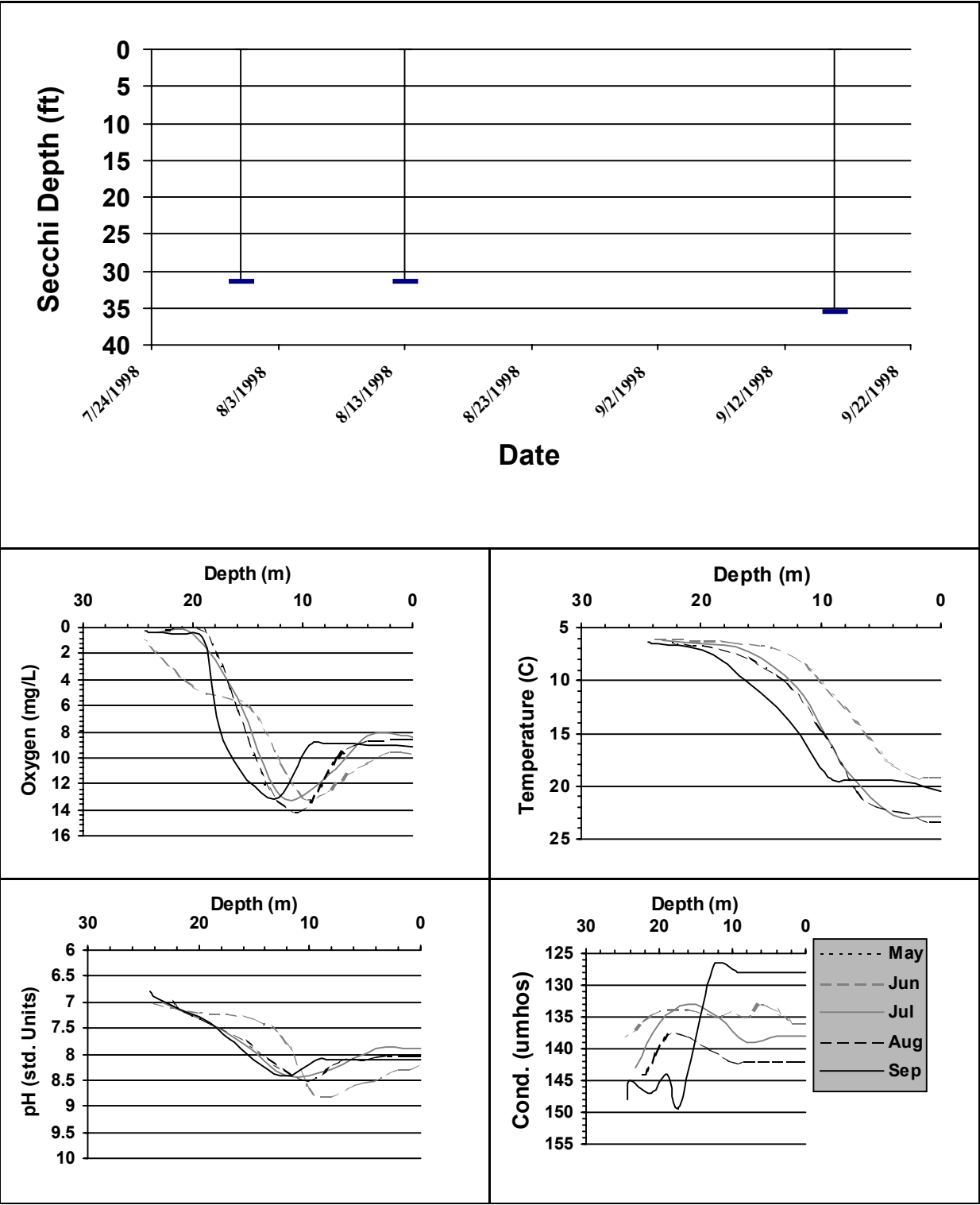
Ratio of large to Small: 0.52

Average size (mm): 0.85

Secchi Depth and Profile Graphics

Station: 1

SUTCL1



Secchi Data and Field Observations

SUTHERLAND

| Date | Time | Temp- erature (F) | Secchi (ft) | Color (1-greens, 11-browns) | Bright- ness (pct) | Wind (1-none, 5-gusty) | Rainfall (0-none, 5-heavy) | Aesthetics (1-bad, 5- good) | Swimming (1-poor, 5- good) | Geese (#) | Waterfowl (besides geese #) | Boats- Fishing (#) | Boats- Skiing (#) |
|-----------|----------------|-------------------------|----------------|---|--------------------------|------------------------------|----------------------------------|-----------------------------------|----------------------------------|--------------|-----------------------------------|--------------------------|-------------------------|
| Station 1 | | | | | | | | | | | | | |
| 6/8/1998 | | | | 1 | 0 | 2 | | 5 | 5 | 0 | 0 | 2 | 0 |
| | Sampler: SMITH | | | Remarks: SEVERAL HOME OWNERS ASSOCIATIONS ON THE LAKE. | | | | | | | | | |
| 7/31/1998 | | | 31.35 | | 100 | 1 | | 5 | 5 | 0 | 1 | 0 | 3 |
| | Sampler: SMITH | | | Remarks: STRONG H2S ODOR FROM 22 METER SAMPLE | | | | | | | | | |
| 8/13/1998 | | | 31.35 | 1 | 0 | 1 | | 5 | 5 | 0 | 2 | 1 | 2 |
| | Sampler: SMITH | | | Remarks: SPOKE WITH DEPUTY. STRONG H2S ODOR IN HYPH | | | | | | | | | |
| 9/16/1998 | | | 35.5 | 1 | 0 | | | 4 | 5 | 0 | 183 | 0 | 0 |
| | Sampler: SMITH | | | Remarks: H2S ODOR AT 22 METERS. The Conductivity and Oxygen results are qualified as estimates due to postcalibration failing QA/QC requirements. | | | | | | | | | |